determining a second value corresponding to an acoustic property of the fluid from the first value and an established calibration value;

determining a third value corresponding to speed of ultrasound in the fluid; and

determining a physical property of the fluid as a function of the second and third values;

wherein the majority of the multiplicity of ultrasound pulse echoes used to determine the first value have a pathlength in the member less than about 0.25 D^2/lambda, where D is the maximum length dimension of the transducer face associated with the member and lambda is the average wavelength of the ultrasound pulse in the member.

40. A method for determining a fluid property comprising:

delivering an ultrasound pulse to a member with a transducer, the member being comprised of a solid material and including a first surface apposite a second surface, the first surface being coupled to the transducer and the second surface being in contact with a fluid, the ultrasound pulse reflecting between the first surface and the second surface to provide an ultrasound pulse echo series;

detecting a multiplicity of the ultrasound pulse echoes of the echo series with the transducer;

determining a first value from the multiplicity of the ultrasound pulse echoes, the first value corresponding to a decay rate of the multiplicity of the ultrasound pulse echoes;

determining a second value corresponding to an acoustic property of the fluid from the first value and an established calibration value;

determining a third value corresponding to speed of ultrasound in the fluid; and

determining a physical property of the fluid as a function of the second and third values;

wherein the transducer produces the ultrasonic pulse in response to a non-sinusoidal voltage input from a pulsar and wherein the first value is determined by selecting a peak echo amplitude at a predetermined frequency for each of the detected echoes and determining a value corresponding to the average decay rate of the selected peak echo amplitude for each of the multiplicity of ultrasound pulse echoes as a function of echo number.

41. The method of claim 40 wherein the transducer produces an output signal in response to the detecting and the transducer output signal is digitized and transformed from time domains to frequency domain prior to selection of the peak echo amplitude for each of the multiplicity of ultrasound pulse echoes.

42. The method of claim 41 wherein at least five of the multiplicity of ultrasound pulse echoes are detected during the detecting.

43. A method for determining a fluid property comprising:

providing a wall having opposed first and second surfaces, an ultrasonic transducer in association with the first surface, and a fluid in contact the second surface;

wherein the transducer has a face associated with the first surface and the distance between the first and second surfaces of the wall is less than the largest dimension of the transducer face;

delivering a pulse of ultrasound to the wall with the transducer, wherein the ultrasound pulse reflects between the first and second surfaces to provide an ultrasound pulse echo series;

detecting a plurality of the ultrasound pulse echoes of the echo series with the transducer;

determining a first value from the plurality of the ultrasound pulse echoes, the first value corresponding to a decay rate of the plurality of the ultrasound pulse echoes; and

determining a second value corresponding to an acoustic property of the fluid from the first value and an established calibration value;

wherein the first value is determined by selecting a peak echo amplitude at a predetermined frequency for each of the detected echoes and determining a value corresponding to the average decay rate of the selected peak echo amplitudes for each of the ultrasound pulse echoes as a function of echo number.

44. The method of claim 43 wherein the transducer produces an output signal in response to the detecting and the transducer output signal is digitized and transformed from time domain to frequency domain prior to selection of the peak echo amplitudes for each of the ultrasound pulse echoes.

45. A method for determining a fluid property comprising:

providing a wall having opposed first and second surfaces, an ultrasonic transducer in association with the first surface, and a fluid in contact the second surface;

wherein the transducer has a face associated with the first surface and the distance between the first and second surfaces of the wall is less than the largest dimension of the transducer face;

delivering a pulse of ultrasound to the wall with the transducer, wherein the ultrasound pulse reflects between the first and second surfaces to provide an ultrasound pulse echo series;

detecting a plurality of the ultrasound pulse echoes of the echo series with the transducer;

determining a first value from the plurality of the ultrasound pulse echoes, the first value corresponding to a decay rate of the plurality of the ultrasound pulse echoes; and

determining a second value corresponding to an acoustic property of the fluid from the first value and an established calibration value;

wherein the majority of the detected pulse echoes used to determine the first value have a pathlength in the wall less than about 0.25 D^2/lambda, where D is the maximum length dimension of the transducer face associated with the member and lambda is the average wavelength of the ultrasound in the member.

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